

**Doug Dittrich  
General Motors  
Regional Sales Manager – Alt Fuel**



**ALLISON HYBRID ELECTRIC DRIVES**





# 55 Cities & 8 OEMs must be right

## The FACTS... ...just the FÄCTS



**Allison**  
Transmission



# Just The Facts...

- Infinite number of gear ranges with electronic variable transmission
  - Others have single gear transmissions
- Over 12,000,000 in-service miles
  - No battery cell failures



CKE with a Allison  
Transmission



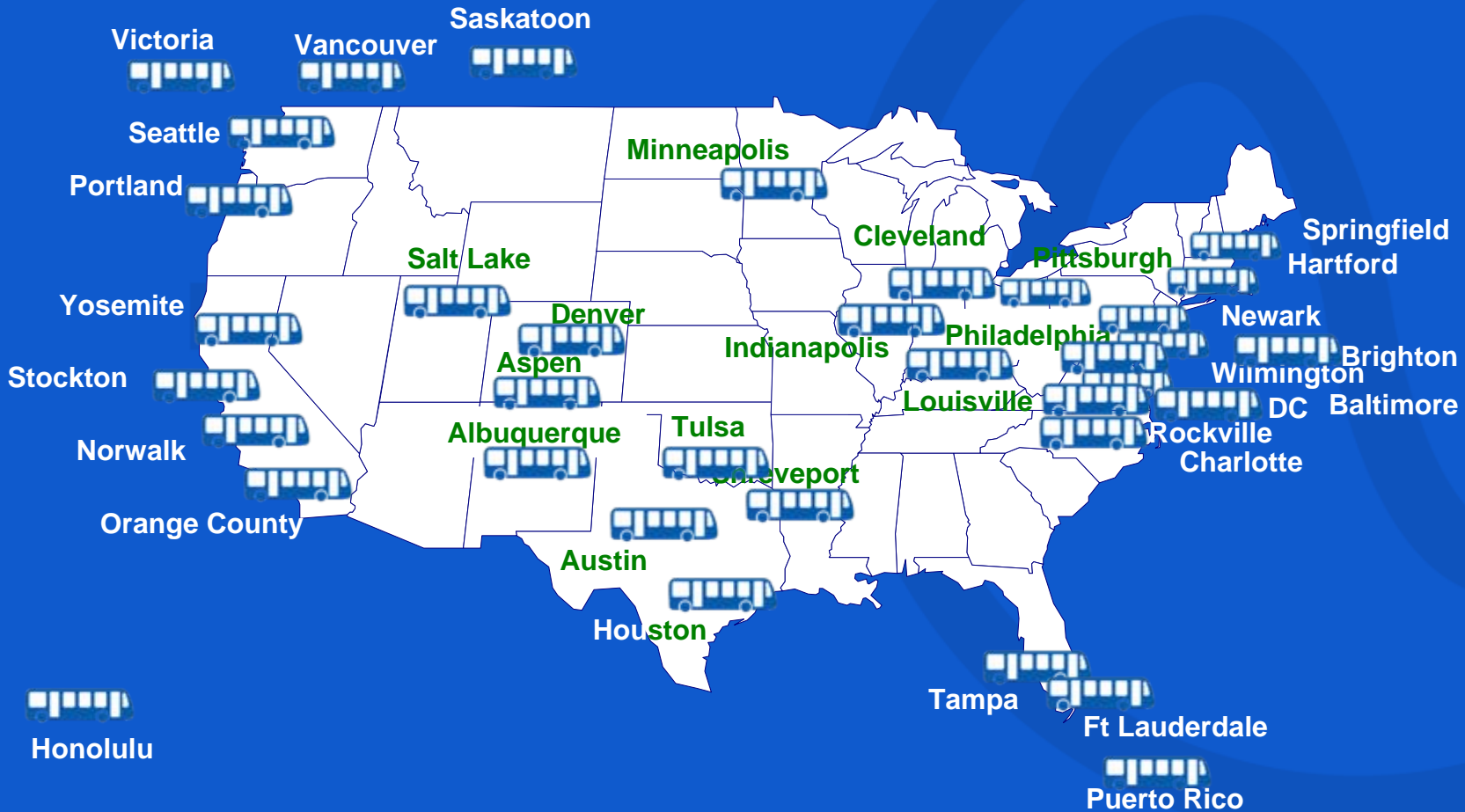
# Just The Facts...

- NREL test – 50 - 75% better fuel economy
- NOx - up to 50% reduction
- PM – Reduced by 51% to 97%
- Noise levels approach passenger car
  - Only 79db @ 10 meters



# GM-Allison Hybrids in Operation

*Total of 446 hybrid buses in 36 cities (as of May 1, 2006)*



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# KING COUNTY METRO HYBRID UPDATE

Jim Boon  
Manager Vehicle Maintenance Section

ALLISON HYBRID ELECTRIC DRIVES



# FLEET SUMMARY

- 236 Hybrids Allison EP-50 Parallel System, CAT C-9 Engine
  - 30 Identical Buses w/o Hybrid Package
  - \$200K Premium for Hybrid
  - Service Debut – June, '04
  - Special Operating Mode Designed for Downtown Bus Tunnel

# MILES & MILEAGE

- 13.8 Million Service Miles
  - First Units Approaching 95K
  - Fuel Economy – 3.2 to 3.8 mpg
  - Conventional Powertrain – 2.5 mpg
  - Aux Coolant Heater Required by CAT
    - Consumes 0.7 gph @ 30% Duty Cycle
    - Actual Duty Cycle – 68%

# FUTURE PROJECTIONS

- Expected Bus Life – 15 Years
  - Expected Battery Life – 5 to 6 Years
  - No Planned Engine Overhauls
  - No Planned Drive Unit Overhauls
  - Testing for Extended Engine and Drive Unit Oil Drain Intervals

King County Metro received  
April 5, 2006

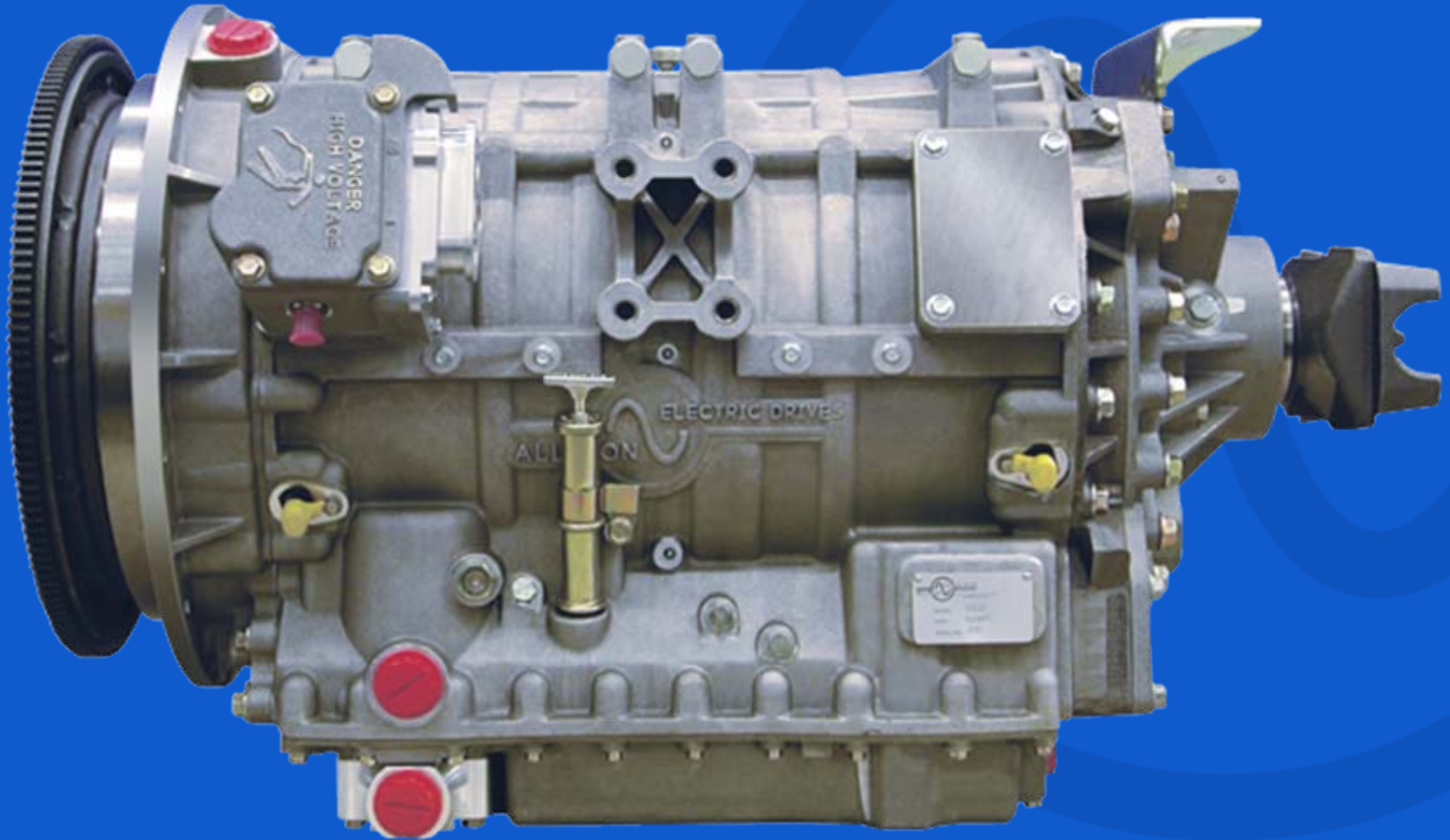
**CLEAN  
AIR**  
Excellence  
Awards

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# King County Initiatives

- Need 20 more hybrid artics because of increased ridership
- If 1/10% Sales Tax passes, considering 190 more hybrid buses
- Ron Sims, King County Executive issued Executive Order in March requiring
  - Reduction in CO<sub>2</sub>
  - More alternative fuel use (going to B20)
  - Consider more hybrid buses to offset CO<sub>2</sub> emissions from cars

# The Real Invention!



**ALLISON HYBRID ELECTRIC DRIVES**

# Allison Energy Storage System

- No “end-of-life battery failures to date in customer vehicles or Allison test vehicles !
- Some are still operating at 3 - 4 years
- Still targeting 6-years life (maybe longer)
- Allison ESS continues be an excellent energy storage system for transit duty

# 0 Failures!

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# GM-Allison Hybrid Bus Deliveries since April 2005

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# Yosemite Received 18 Gillig Hybrids Spring 2005



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# National Park Guides for 2006



**THE ROAD TO A CLEANER ENVIRONMENT RUNS RIGHT THROUGH YOSEMITE.**



This year, visitors are discovering a greener path at Yosemite. One that has cleaner air and less noise. But it isn't a new trail. It's the guided tour route. A fleet of shuttle buses powered by GM electric hybrid technology are now in service, and they're already making a noticeable difference,

with 90% fewer emissions than conventional diesel buses. They're also much quieter and more fuel efficient. And with these buses carrying up to 1,050 passengers per hour, there's less traffic in the park. All good news for nature lovers. When it comes to practical energy solutions, all roads lead to GM.

CHEVROLET

BUICK

PONTIAC

GMC

SATURN

HUMMER

SAAB

CADILLAC



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# WMATA – Washington DC (50)



**The Year of the Bus**

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# Cleveland – Euclid Corridor BRT (21)



at Altoona for test

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# Roaring Fork Transit Authority – Aspen Colorado



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# Crystal Transport - Massachusetts



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# Fort Lauderdale Airport



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# Puerto Rico (4)



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# Baltimore –MTA (10)



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# Denver RTD (4)



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# Tulsa OK (1)



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# Springfield MA (1)



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# Shreveport (1)



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# Montgomery County, Maryland (5)



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# California Hybrid Bus Consortium



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May 1, 2006

# 19 New Cities on Order

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## Other Additional Cities

• Bloomington, IN	2	Gillig
• Buffalo, NY	43	Gillig
• Chicago, IL	10	New Flyer
• Edmonton, AB	2	New Flyer
• Eugene, OR	6	New Flyer
• Evansville, IN	4	Gillig
• Grand Rapids, MI	2	Gillig
• Humboldt, CA	4	Gillig
• Lafayette, IN	2	Gillig

# Other Additional Cities (continued)

• Lansing, MI	10	New Flyer
• Las Vegas, NV	30	New Flyer
• Memphis, TN	4	Gillig
• Modesto, CA	1	Gillig
• Santa Barbara, CA	8	Gillig
• Sarasota, FL	10	Gillig
• Saskatoon, SK	4	New Flyer
• Vail, CO	1	Gillig
• Douai, France	12	APTS

# Other Additional Cities (continued)

- Honolulu 40 New Flyer
- Houston (pending) 40 New Flyer
- Washington DC (planned) 50
- Philadelphia (RFQ soon) 400+
- Seattle
- Albuquerque
- St Paul

# APTS 80-foot Tram – Douai, France (12)



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# Sunwin - Shanghai, China



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# GM-Allison

## Error-Proof Manufacturing

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Capacity to build a hybrid for  
3500 new transit buses/year





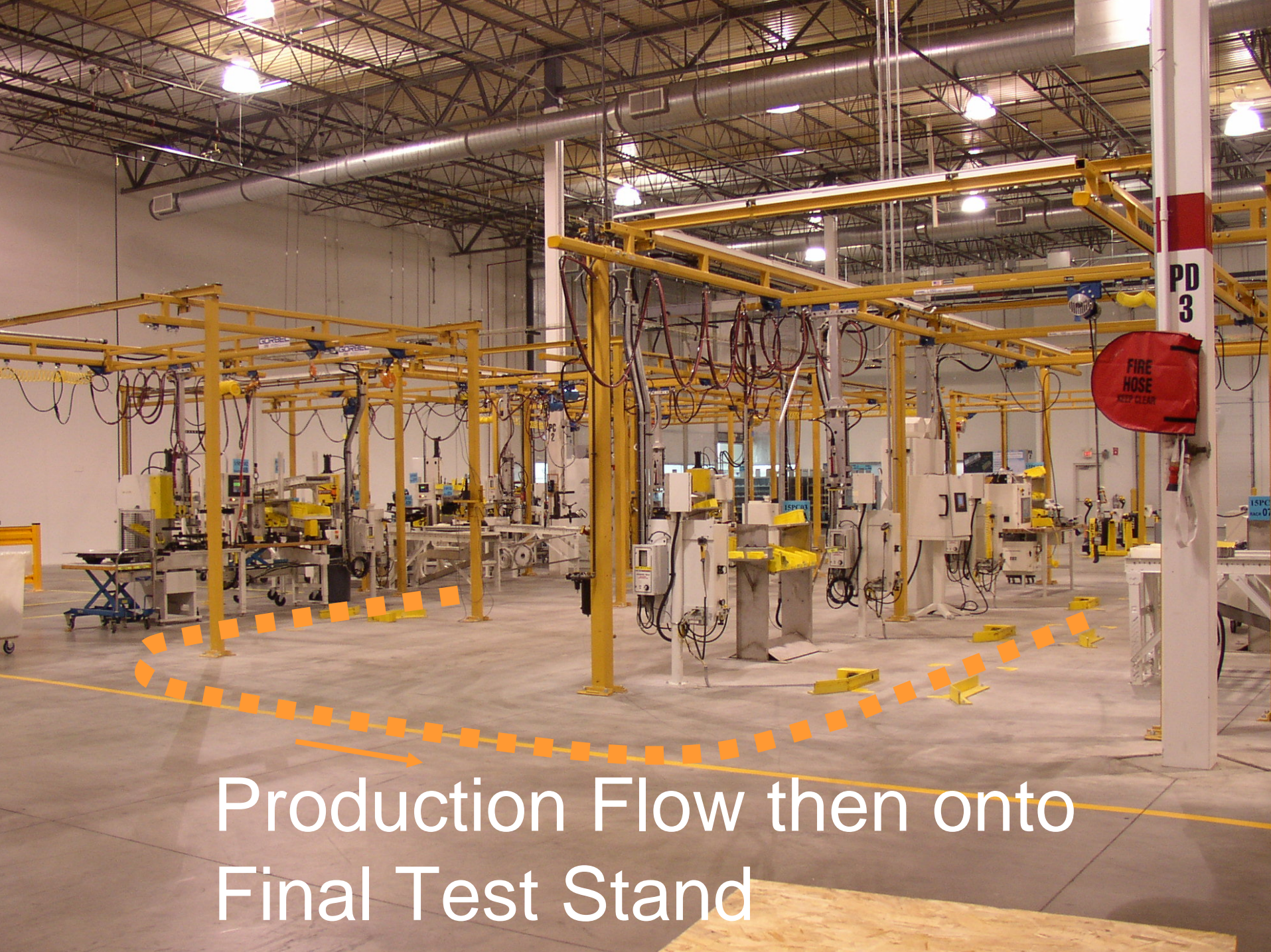
Error-Proof Subassembly Stations





Error-Proof Assembly Stations





Production Flow then onto  
Final Test Stand





Test Stand Preparation





Dedicated Test Stand

MT 6120

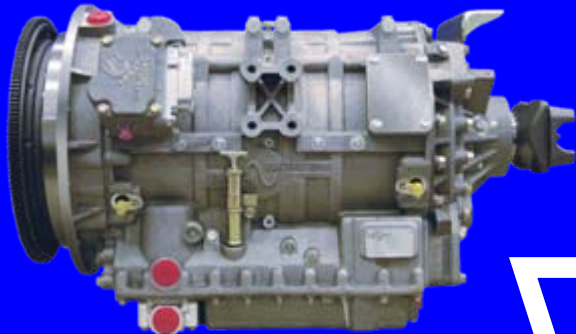




Tested and ready to go!

# EP System™ Scalability

EP 40/50



AHSII



2008 Tahoe



2008 Yukon



2009 Silverado

GM



2008 Tahoe (Nov.  
2007)

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**SMELL THAT EXHAUST?  
WASN'T ME.**

Your GM powered  **HyBRID** bus has arrived.



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